REMARKS

By the above actions, the specification and claims 1, 3 & 4 have been amended. In view of these actions and the following remarks, reconsideration of this application is now requested.

Firstly, before addressing the issues raised in the Examiner's Office Action, the undersigned wishes to bring the Examiner's attention to a problem that was only just noted during preparation of a response to the present Office Action. In particular, while the copy of the present application that was sent to the inventors for review contained the $\geq$ and $\leq$ added to paragraphs [0032]-[0034], [0038], [0043], & [0045] and claims 3 & 4, and it was in the word processing text from which the application papers filed were printed. However, due to a printer font set problem, $\geq$ and $\leq$ symbols did not print, and as noted above, this fact was not realized until now. Thus, the above amendments add the missing $\geq$ and $\leq$ symbols and it is submitted that such should not be considered new matter since those of ordinary skill in the art would have recognized that mathematical symbols were missing and would have recognized the nature of those symbols from the descriptions in the specification pertaining to these relationship. For example, paragraph [0045] describes the ability of the invention to maintain the inherent frequency and notes in the second and third lines from the bottom of page 9 that it can be maintained even if d/D "exceeds 0.13" so that it would be clear that the missing mathematical symbol in the preceding two lines would be $\geq$.

Turning now to the issues raised by the Examiner, in view of the rejection for indefiniteness under 35 U.S.C. § 112, claim 1 has been amended to recite the basic constructional features of the fan, i.e., that the fan has a hollow cylindrical fan body with side plates, a plurality of blades disposed in a circumferential array and extending axially between the side plates, and a rotating shaft connected to the side plates for rotating the fan body. Thus, withdrawal of this rejection is in order and is now requested.

Claim 1 stands rejected under 35 U.S.C. § 102 based on the disclosure of the Webb '735 patent. However, Webb indicates that his fan is of the type described in detail in Akins et al. U.S. Patent No. 5,023,884, a copy of which is appended hereto along with a form 1449 for use by the Examiner in making this patent of record. However, neither the Webb '735 patent nor Akins et al. patent show or describe the fans shaft as passing through the body of the fan. On the other hand, an earlier Webb patent, U.S. 5,870,420 (cited on page 3 of the present specification, a copy of which was previously submitted in an IDS and was indicated

to have been considered by the Examiner in the copy of the form 1449 returned by him), also references the Akins et al. patent and does describe a cross-flow blower of the type shown in the Webb '735 and Akins et al. patents. The appended Webb '420 patent states that its fan differs from that of the Akins et al. patent solely in the addition of the truss members, states that "[a]t least one of the end frame members comprise mounting holes for attaching a motor drive unit. Thus, it is clear that the motor drive of the later Webb '735 relied upon by the Examiner, does not have the drive shaft passing through the fan body as is the case for the present invention, but rather is attached to the end plate of the fan. Therefore, withdrawal of the anticipation rejection under § 102 is in order and is requested.

Claims 2-4 have been rejected under 35 U.S.C. § 103 as being unpatentable over the the Webb '735 patent when viewed in combination with the Secunda et al. patent. However, it is submitted that the Secunda et al. patent constitutes non-analogous prior art relative to both the present invention and the Webb '735 patent being directed to a liquid-solids separation process, not the cross-flow fan of a gas discharge laser of the Webb '735 or of the present invention. Not only is it from a different field from the present invention, but its disclosure of spinner 70 having a hollow drive shaft 96 for the purpose of allowing the inlet pipe 98 to pass through it to allow the fluid to be separated to be discharged into the center of the spinner 70 is not reasonably pertinent to the problem of vibration in cross-flow fans and applicants' solution to that problem. Thus, the combination of the Webb '735 patent with the Secunda et al. patent is improper, and thus, so is the rejection based thereon. Therefore, reconsideration and withdrawal of this rejection are in order and are now requested.

While the present application is now believed to be in condition for allowance, should the Examiner find some issue to remain unresolved, or should any new issues arise, which could be eliminated through discussions with applicant's representative, then the Examiner is invited to contact the undersigned by telephone in order that the further prosecution of this application can thereby be expedited.

Lastly, it is noted that a separate Extension of Time Petition accompanies this response along with a check in payment of the requisite extension of time fee. However, should that petition become separated from this Amendment, then this Amendment should be construed as containing such a petition. Likewise, any overage or shortage in the required payment should be applied to Deposit Account No. 19-2380 (740145-180).

Respectfully submitted,

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Mark-Up Showing Amendments Made

In the Specification:

Please amend paragraph numbers [0032]- [0034], [0043], & [0045] as follows:

[0032] The inventors have conducted various experiments, the results of which revealed that the flow rate is not adversely affected under high-head, low-flow-rate use conditions if a rotating shaft of diameter d is mounted in a cross-flow fan such that $d/D \geqq 0.07$ (d: diameter of rotating shaft, D: fan outer diameter).

[0033] In addition, rotating shaft diameter d exceeding $d/D \geqq 0.13$ would be desirable in the case of a cross-flow fan capable of high-speed rotation used in an excimer laser device in which the cyclic frequency of the laser pulse is high because of the relation with the axial strength.

[0034] The above-mentioned problems were solved in the present invention based on aforementioned facts.

(1) A rotating shaft piercing the center of a cross-flow fan is mounted in a cross-flow fan for a discharge excitation gas laser.

(2) A hollow section is provided within the rotating shaft in (1).

(3) When the outer diameter of the cross-flow fan in (1) and (2) is taken as D and the diameter of the rotating shaft is taken as d, the relationship would be $d/D \geqq 0.13$.

[0038] The inherent oscillation frequency of a cross-flow fan can be raised by setting $d/D \geqq 0.013$ as indicated in (3) above, and resonance can be eliminated even at maximum rotational speed exceeding 4000 rpm.

[0043] Furthermore, Figure 3 shows the magnitude of vibration of a laser chamber to which a fan is attached. In the diagram, the abscissa represents the speed of rotation (rpm) of the fan while the ordinate represents the vertical vibration acceleration (m/s^2) within the chamber. The diagram shows the characteristics of a conventional fan (curve 1) that lacks a

piercing rotating shaft and a fan of this embodiment that has a piercing rotating shaft (curve 2). The fan has diameters D = 120 mm and d = 23 mm with a 600 mm length in the axial direction. In addition, the conventional example was identical with this embodiment other than for the fact that the rotating shaft did not pierce the fan interior. As indicated by the results shown in Figure 3, the vibration acceleration could be reduced by about ½ as compared to the conventional example.

In the past, as explained above, no problem arises if $d/D \leqq 0.07$, taking rotating shaft diameter as d and fan outer diameter as D, when a rotating shaft is mounted within a cross-flow fan. Specifically, adverse effects result if $d/D \leqq 0.07$, but the gas flow rate does not change from that of a conventional fan even if a central shaft of d/D = 0.19 is mounted in aforementioned embodiment under conditions of low flow rate and high head as in a laser chamber.

[0045] Thus, the diameter d of the rotating shaft was computed for the case in which the axial length of a cross-flow fan is equal to the electrode length of an excimer laser so that the inherent oscillation frequency would exceed 95 Hz. For example, the following would apply to maintain the inherent oscillation frequency above 95 Hz when the electrode length of an excimer laser is 600 mm and the material comprising the rotating shaft is stainless (SUS). Here, d is the diameter of the rotating shaft as above while D represents the outer diameter of the fan.

If the fan diameter is 120 mm.. $d/D \geqq 0.16$

If the fan diameter is 150 mm.. $d/D \geqq 0.13$

Specifically, the inherent oscillation frequency could be maintained above 95 Hz if d/D.

In the Claims:

1. (Amended) A cross-flow fan for a discharge excitation gas laser to circulate laser gas between electrodes disposed within a laser chamber in which laser gas is circulated, comprising a hollow cylindrical fan body with side plates, a plurality of blades disposed in a circumferential array and extending axially between the side plates, and a rotating shaft

connected to the side plates for rotating the fan body, wherein the rotating shaft of the cross-flow fan passes through the center of said fan.

3. (Amended) The cross-flow fan for discharge excitation gas laser of Claim 2, in which the outer diameter of the cross-flow fan D and the outer diameter of the rotating shaft d are sized in accordance with the relationship $d/D \geqq 0.13$.

4. (Amended) The cross-flow fan for discharge excitation gas laser of Claim 1, in which the outer diameter of the cross-flow fan D and the outer diameter of the rotating shaft d are sized in accordance with the relationship $d/D \geqq 0.13$.